DOCUMENT RESUME

ED 151 582 CE 015 249

AUTHOR Cowan, Douglas K.
TITLE Comparative Occupational Survey of USAF Civilian and Military Members in Three Civil Engineering Specialties. Final Report for Period 1 October 1975-31 August 1977.
INSTITUTION Air Force Human Resources Lab., Brooks AFB, Texas.
REPORT NO AFHRL-TR-77-78
PUB DATE Dec 77
NOTE 31p.

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS *Bricklayers; *Carpenters; Civil Engineering; Cluster Grouping; Comparative Analysis; *Government Employees; *Job Analysis; Job Skills; Job Training; *Military Personnel; Occupational Information; Occupational Surveys; *Plumbing; Task Performance; Tenure; Vocational Aptitude; Work Attitudes
IDENTIFIERS Air Force; United States

ABSTRACT

Military and civil service carpenters, masons, and plumbers were surveyed using a job inventory checklist and relative time spent rating method along with background item responses. Job clustering and job typing of combined responses were performed and comparisons were made between civilian and military groups as well as comparisons between the two groups on several background variables. Data revealed that civilian and military members in the respective specialties are performing approximately equally. Significant differences were found between the two groups in the number of tasks performed, job difficulty, months in job, job interest, and job utilization of training and talents. Overall job interest and job utilization of training and talents were found to be relatively high for both civilian and military members. (Author/BM)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

CE

AFHRL-TR-77-78

AIR FORCE

HUMAN RESOURCES

LABORATORY

ED151582

# COMPARATIVE OCCUPATIONAL SURVEY OF USAF CIVILIAN AND MILITARY MEMBERS IN THREE CIVIL ENGINEERING SPECIALTIES

By

Douglas K. Cowan

OCCUPATION AND MANPOWER RESEARCH DIVISION
Brooks Air Force Base, Texas 78235

December 1977

Final Report for Period 1 October 1975 – 31 August 1977

Approved for public release; distribution unlimited.

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

CE 015 245

AIR FORCE SYSTEMS COMMAND
BROOKS AIR FORCE BASE, TEXAS 78235

2

NOTICE

When U.S. Government drawings, specifications, or other data are used for any purpose other than a definitely related Government procurement operation, the Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise, as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

This final report was submitted by Occupation and Manpower Research Division, under project 7734, with HQ Air Force Human Resources Laboratory (AFSC), Brooks Air Force Base, Texas 78235.

This report has been reviewed and cleared for open publication and/or public release by the appropriate Office of Information (OI) in accordance with AFR 190-17 and DoDD 5230.9. There is no objection to unlimited distribution of this report to the public at large, or by DDC to the National Technical Information Service (NTIS).

This technical report has been reviewed and is approved for publication.

RAYMOND E. CHRISTAL, Technical Director
Occupation and Manpower Research Division

DAN D. FULGHAM, Colonel, USAF
Commander

## REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: AFHRL-TR-77-78
2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle): COMPARATIVE OCCUPATIONAL SURVEY OF USAF CIVILIAN AND MILITARY MEMBERS IN THREE CIVIL ENGINEERING SPECIALTIES

5. TYPE OF REPORT & PERIOD COVERED: Final, 1 October 1975 – 31 August 1977

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s): Douglas K. Cowan

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS: Occupation and Manpower Research Division, Air Force Human Resources Laboratory, Brooks Air Force Base, Texas 78235

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 62703F, 77340120

11. CONTROLLING OFFICE NAME AND ADDRESS: HQ Air Force Human Resources Laboratory (AFSC), Brooks Air Force Base, Texas 78235

12. REPORT DATE: December 1977

13. NUMBER OF PAGES: 28

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)

15. SECURITY CLASS. (of this report): Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

| | | | |
|---|---|---|---|
| Air Force specialty code | Comprehensive Occupational Data Analysis Program (CODAP) | | |
| carpenters | General Schedule | job interest | military |
| civil engineering | hierarchical grouping | job inventory | plumbers |
| civil service | job descriptions | job utilization | skill level |
| civilian job series | job difficulty | masons | wage grade |
| occupational analysis | | | |

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Military and civil service carpenters, masons, and plumbers were surveyed using a job inventory check list and relative time spent rating method along with background item responses. Job clustering and job typing of combined responses were performed and comparisons made between civilian and military groups as well as comparisons between the two groups on several background variables. Data reveal that civilian and military members in the respective specialties are performing approximately equally. Significant differences were found between the two groups in the number of tasks performed, job difficulty, months in job, job interest, and job utilization of training and talents. Overall job interest and job utilization of training and talents are relatively high for both civilian and military members.

## TABLE OF CONTENTS


| | | Page |
|---|---|---|
| I. | Introduction | 3 |
| II. | Method | 3 |
| | Development of the Job Inventories | 3 |
| | Sample Size and Selection of Incumbents | 4 |
| | Job Inventory Administration | 4 |
| | Merged Military-Civilian Samples | 5 |
| | Comprehensive Occupational Data Analysis Programs (CODAP) | 5 |
| | Hierarchical Grouping | 5 |
| | Skill Level Grouping | 5 |
| III. | Results and Discussion | 7 |
| | Major Command Representation | 7 |
| | Comparison of Civilian/Military Personnel on Six Variables | 8 |
| | Average Number of Tasks Performed | 8 |
| | Average Task Difficulty Per Unit of Time Spent | 8 |
| | Job Difficulty Index | 8 |
| | Months in Job | 10 |
| | Job Interest | 10 |
| | Job Utilization of Training and Talents | 10 |
| | Average Civilian and Military Grade Level | 10 |
| | Correlations Among Six Job Variables | 11 |
| | Comparison of Civilian and Military Members in Duty Performance | 12 |
| | Carpenter's Functional Duties | 12 |
| | Progression to AFSC 55270 (Structural Technician) | 17 |
| | Tool and Equipment Utilization | 17 |
| | Civilian Job Series Classification | 17 |
| IV. | Summary and Conclusions | 21 |
| References | | 22 |
| Appendix A: | Civilian Job Series Classification by AFSC | 23 |


## LIST OF ILLUSTRATIONS


| Figure | | Page |
|---|---|---|
| 1 | Hierarchical grouping -- plumbers, carpenters and masons | 6 |
| 2 | Locksmith functions | 18 |
| 3 | Skill progression to AFSC 55270 | 19 |
| 4 | Tool and equipment utilization by plumbers, carpenters, and masons | 20 |

## LIST OF TABLES


| Table | | Page |
|---|---|---|
| 1 | Major Command Distribution | 7 |
| 2 | Comparison of Civilian and Military Members on Six Job Variables | 9 |
| 3 | Average Civilian and Military Grade Level by Specialty | 11 |
| 4 | Comparison of Civilian and Military Groups' Intercorrelations Among Six Variables | 11 |
| 5 | Percent Plumbers Performing Duties by Skill Level | 13 |
| 6 | Plumbers – Percent Time Spent in Duties by Skill Level | 14 |
| 7 | Percent Carpenters and Masons Performing Duties by Skill Level | 15 |
| 8 | Carpenters and Masons – Percent Time Spent in Duties by Skill Level | 16 |
| 9 | Cabinet Making Tasks Requiring Fixed or Stationary Equipment | 17 |
| A1 | Carpenters, Masons, and Plumbers Job Series Classification by AFSC | 24 |

# COMPARATIVE OCCUPATIONAL SURVEY OF USAF CIVILIAN AND MILITARY MEMBERS IN THREE CIVIL ENGINEERING SPECIALTIES

## I. INTRODUCTION

Job information collected from military members, using methodologies prescribed in AFM 35-2,[1] has proven to be highly accurate. The impact of the occupational analysis program on military training emphasis throughout the Air Force has been substantial, resulting in millions of dollars of documented training cost avoidance. In additon, career fields have been restructured and Air Force specialty descriptions have been revised to be more indicative of actual job performance.

Within the civilian employee area, an initial effort by Garza (1972) in collecting and analyzing data from General Schedule employees in the Accounting and Finance field proved successful, indicating that participation in job surveys by civilian federal employees is feasible. The successful job analyses performed by Garza and a request by HQ USAF/PREM (Civil Engineering) to include civilians in future occupational surveys formed the basis for this study. Since it is the desire of the Directorate of Civil Engineering to attempt to define upgrade training requirements and to understand civilian utilization patterns in conjunction with military personnel, the best approach is to include civilians in joint civilian/military job surveys. The plumbing, carpentry, and masonry specialties were selected for comparative analysis in this study because of the relatively large population available and the approximately equal numbers of civilian and military members assigned to the specialties.

Civil engineering organizations are structured in a manner that provides a force that is approximately 50% civilians. However, it was not known if civilian and military members perform nearly indentical duties and tasks. AFM 26-1, Manpower Policies and Procedures, provides only limited guidance in the use of civilian employees within Air Force specialties (AFS) and specifies that the Air Force specialty codes (AFSC) are intended as broad indicators of civilian skills and skill-levels required. There is a small amount of empirical evidence (Stacy, 1973) that differences in job assignment or level of responsibility do exist between military and civilian members in two career ladders in the civil engineering area as indicated by reports from the field and felt utilization of training and talents. The goal of this study is to identify any significant differences between the two groups in functional areas of assignment, duties and responsibilities, and utilization of equipment and tools. Other variables in which differences may be expected are the number of tasks performed, average task difficulty, job difficulty, job tenure, job interest, and utilization of training and talents. Garza and Carpenter (1974) reported significant differences between military and General Schedule civil service employees with respect to such variables. These variables will be treated in difference comparisons between the civilian employees within the four civil service classifications (General Schedule, Wage Supervisor, Wage Leader, and Wage Grade) found in the plumbing, carpentry, and masonry trades in Air Force civilian federal service and Air Force military counterparts in the same fields.

[1] AFM 35-2 was revised and reissued as AFR 35-2, 6 December 1976.

## II. METHOD

### Development of the Job Inventories

*Plumber (Military).* The data collection instrument, a job inventory, was developed by the USAF Occupational Measurement Center, Lackland AFB, Texas. The inventory was composed of three parts: a personal information section in which job incumbents provided information about themselves; a job assignment background information section; and a duty-task listing of the plumbing specialty which required the incumbent to rate each task he performed using a relative time spent scale. The duty-task listing consisted of 13 major duties encompassing 407 task statements constructed from data gained from research of publications and directives, personal interviews with subject matter specialists, and written field reviews from 55 experienced military plumbers. Comments and suggestions for improvement of the job inventory, received from the written review, were incorporated into the final version of the job inventory, if applicable.

*Plumber (Civilian).* The duties and tasks developed for military incumbent use were incorporated into the civilian job inventory along with modified background variables specific to civilians and variables that were applicable to both civilian and military personnel. The background variables were then reviewed by 11 civilian craftsmen at three local Air Force bases for content, format, and acceptability of the questions to the individuals. Twenty geographically selected bases across the United States were then chosen to solicit civilian plumbing craftsmen to participate in a field review of the plumbing job inventory. Completed field reviews were received from 17 bases encompassing seven major commands. No additional duties or tasks were identified, nor were any adverse comments received about the propriety of the background questions.

*Carpenter and Mason (Military).* The job inventory booklet used for data collection, developed by the USAF Occupational Measurement Center, Lackland AFB, Texas, contained a background information section that asked for information concerning the incumbent as well as information about the use of various tools and items of equipment. A second section contained a duty-task listing in which job incumbents identified tasks they performed and then rated each identified task using a relative time spent scale. Twenty-one duties and 563 tasks were developed through research using plans of instruction, specialty training standards, career development courses, manuals, etc. Personal interviews with highly qualified job incumbents from Davis-Monthan, Lackland, Randolph, and Vandenberg AFBs, as well as interviews with course instructors at Sheppard AFB, Texas, were conducted during the course of producing the preliminary field test version of the job inventory. The field test version was then mailed to 80 experienced noncommissioned officers (NCO) at the 7- and 9-skill levels in the specialty area located at 30 separate bases within the continental United States. Comments and suggestions for improvement of the preliminary job inventory were reviewed and appraised and, if appropriate, were incorporated into the final version of the job inventory.

*Carpenter and Mason (Civilian).* Identical duties and tasks were incorporated into the civilian job inventory along with modified background variables specific to civilians and variables that were applicable to both civilian and military personnel. The background variables, along with the duties and tasks, were reviewed by three civilian masons and 11 civilian carpenters assigned to three local Air Force bases for job content, format of task statements, and acceptability of the personal history questions. Twenty geographically selected bases across the United States were then chosen from which highly qualified civilian carpenter and mason supervisors were solicited to participate in a field review of the job inventory. Completed field reviews were received from 18 supervisors encompassing seven major commands or separate operating agencies. No additional duties or tasks were identified, nor were any adverse comments received concerning the propriety of the background questions.

**Sample Size and Selection of Incumbents**

*Military Incumbents.* Job inventory booklets were mailed to the consolidated base personnel offices (CBPO) worldwide for administration to all available members assigned duty in AFSCs 55230, 55250, 55270, 55233, 55253, 55235, 55255, 55275, and 55295. The uniform airman record (UAR) was used to determine the number of military assigned as well as the duty location of the personnel and the responsible CBPO. The estimated population of carpenters and masons was determined to be approximately 2,400 members while the population of plumbers was estimated to be 1,500.

*Civilian Incumbents.* Sample size was totally dependent upon the number of civil service carpenters, masons, and plumbers who voluntarily consented to complete job inventories. The Civilian Automated Data File (E-201) was used to determine the number of civilians assigned duty in the specialties. The E-201 file is a centrally compiled file from which the number of civilian personnel assigned to each skill level of any desired AFSC by location of assignment can be derived. The estimated population of carpenters and masons was approximately 2,600 members while the estimate of assigned plumbers was about 1,200 employees.

**Job Inventory Administration**

*Military Sample.* Job inventories were administered by the survey control officers at the CBPOs during the time period March through June 1975 for the plumbers and during October 1974 through January 1975 for the carpenters and masons. A 67% return rate of usable booklets

resulted in a sample of 1,007 plumbers while a 53% return rate for carpenters and masons produced a sample of 1,263 incumbents.

*Civilian Sample*. Job inventories were administered by civilian personnel officers to voluntary participants in the study during the time period July through October 1975. Usable return rate for the plumbers was 54% of the population representing 651 incumbents. The return rate for the carpenters and masons was 58% of population resulting in usable job inventory responses from 1,496 incumbents.

**Merged Military-Civilian Samples**

Raw data responses for the two groups for each job survey were merged into one sample in preparation for computer operations using the Comprehensive Occupational Data Analysis Programs (CODAP) (Archer, 1966; Morsh & Christal, 1966). Separate CODAP analyses were performed for the plumber and carpenter/mason job inventories.

**Comprehensive Occupational Data Analysis Programs (CODAP)**

CODAP contains approximately 40 general purpose programs (Christal, 1974) consisting of nearly 50,000 program instructions. Basic to the first step in analysis of the job information data, the computer converts each individual's relative time spent ratings to percent time values. This is accomplished by summing all the incumbent's ratings that are assumed to account for 100 percent of his time spent on the job. Each task rating is then divided by the total task responses and the quotient multiplied by 100 to obtain a percent time spent estimate for each task. For job analysis, a hierarchical grouping program (Christal & Ward, 1967) is used in which each individual is compared with every other individual in terms of percent time spent estimates for each task in the inventory. The two most similar individuals are formed into a group by the computer and in successive stages other members are added to the group or new groups are formed based upon the similarity of percent time estimates. Each group formed is identified by a unique three-digit number; e.g., GRP 001 indicates the last group formed and contains all members of the sample. Other CODAP programs convert raw data background variable responses into quantified form which may then be summarized by group identity, special category based on background variables, etc. Numerous specific reports are obtainable through use of the CODAP to assist in job analysis, such as comparisons between groups, or lists of primary tasks performed by job type (those individuals who group together doing almost identical work and having similar background histories) or job clusters, in which the work performed by the individuals is highly homogeneous, but not to the same extent of similarity as the job type.

**Hierarchical Grouping**

The results of hierarchical grouping are shown in Figure 1. Comparative job descriptions by job cluster are not included in this report, but are available to qualified users upon request. Representative cluster titles have been furnished to differentiate between the groups.

**Skill Level Grouping**

Military personnel (without prior military service) enter into an assigned job specialty in primarily three ways: (a) through a technical school where, upon graduation, they are awarded the semi-skilled apprentice specialty and are immediately placed in on-the-job training (OJT) for upgrade training to the specialist level; (b) by way of a directed duty assignment (DDA) from basic military training without benefit of a technical training school with entry into OJT to the apprentice level; and (c) by way of a by-pass test administered to the recruit at the Armed Forces examining and entrance stations (AFEES). The by-pass test is administered to those personnel who profess a knowledge of a specialty gained from civilian experience. Successful scoring on the test negates the necessity of sending the recruit to basic technical school or assigning him as a DDA for entry into OJT to the 3-skill level. He completes basic military training in normal fashion and is then assigned to a permanent duty station as an apprentice and entered into the specialist OJT program. Attaining the specialist AFSC, the airmen is not entered into upgrade training to the technician level until he has been promoted to the grade of E-5. Normally, certain time-period constraints are also in effect during the period of OJT plus the requirement to achieve a passing score on a specialty knowledge test (SKT). The Structural Superintendent AFSC is reserved for those senior level airmen assigned to 9-level slots on the unit detail listing (UDL) or to airmen in the grade of E-8 or E-9. Promotion to the grade of E-8 and simultaneous awarding of the 9-skill level is dependent upon achieving a passing

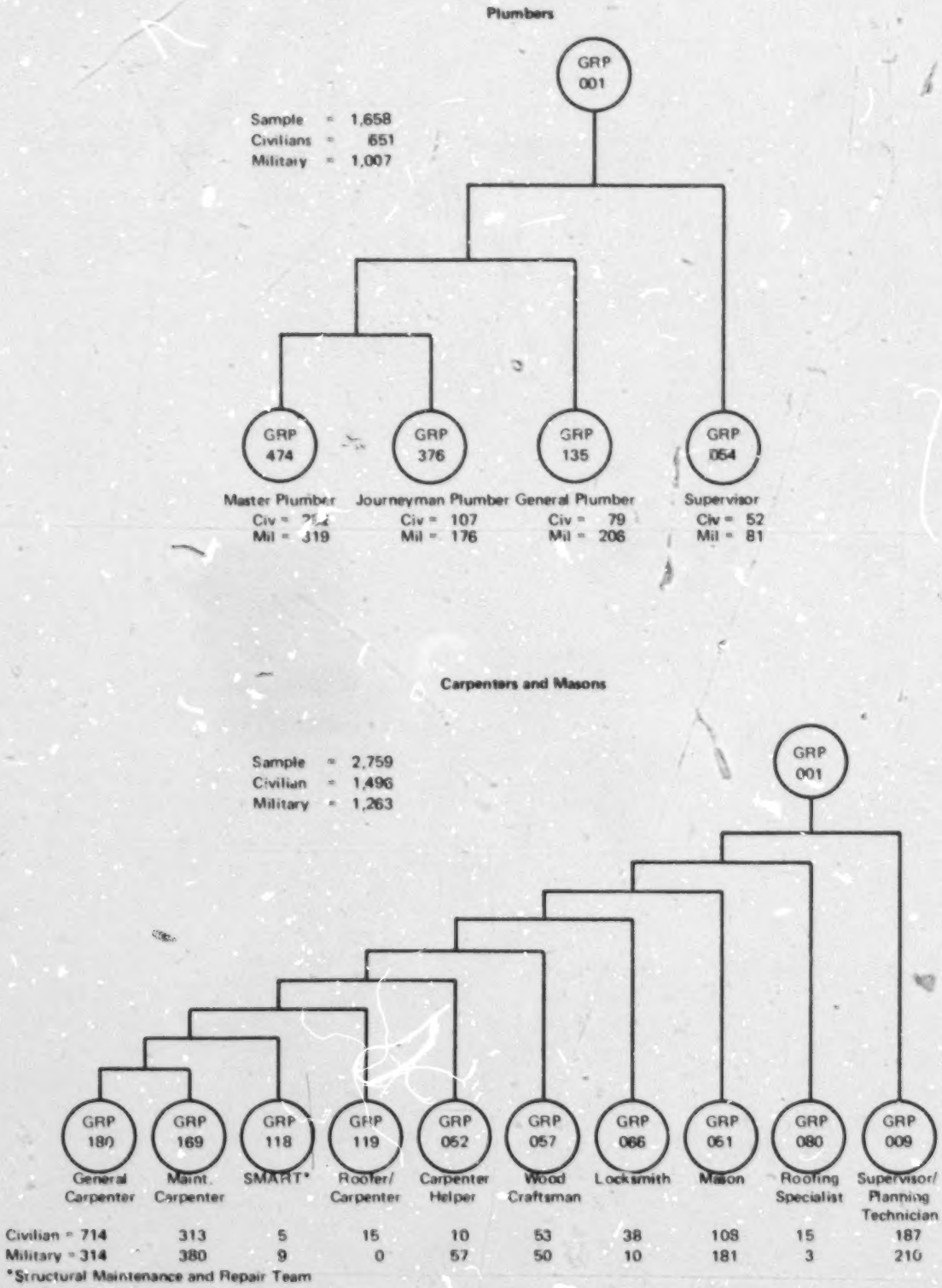



*Figure 1.* **Hierarchical grouping – plumbers, carpenters and masons.**

score on the Supervisor Examination which is administered to E-7s to partially fulfill the eligibility requirements for promotion.

Civilian personnel are hired to fill specific vacancies and are assumed to be fully qualified for the position for which they are hired. An exception to the fully qualified requirement is apparent for those in-service civilian employees who are selected for a trainee position that normally carries a higher grade level with promotion to the higher grade level contingent upon successfully completing a mandatory training period. Another exception, although very similar to the one above, is the upward mobility program which allows members to gain higher level skills and hence higher level grades through on-the-job training.

A civilian is not awarded a skill level as is an airman nor is he required to demonstrate his proficiency to progress from one skill level to another in order to achieve promotion. The AFSC that is associated with the civilian is a functional part of the UDL and is assigned to a specific slot. Thus, a fully qualified civilian may be assigned a 3-, 5-, 7-, or even a 9-skill level depending upon the strength level restraints of the unit to which he is assigned and the job series classification aligned with that position.

Even though the skill level does not carry the same meaning for the civilians as it does for the military, the intent of the skill level on the manning document is the same – to identify jobs requiring a specified level of competence. In this respect, it is permissible to compare civilian and military skill level groups.

Duty descriptions were obtained for each of the four skill levels (3, 5, 7, and 9) for both civilian and military members. Discussion of civilian/military skill level duty descriptions will follow later in the text.

## III. RESULTS AND DISCUSSION

### Major Command Representation

Approximately 80% of the combined samples for both job surveys represent incumbents assigned to seven major commands (see Table 1). Three of the commands (SAC, TAC, MAC) are operational types, three (ATC, AFLC, AFSC) are support types, and one (PACAF) a combination of both operational and support.

*Table 1.* **Major Command Distribution**

| Major Command | Plumbers | | | | | | Carpenters and Masons | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Civilian | | Military | | Combined | | Civilian | | Military | | Combined | |
| | N | % | N | % | N | % | N | % | N | % | N | % |
| AAC | 13 | 0.78 | 22 | 1.33 | 35 | 2.11 | 37 | 1.34 | 39 | 1.41 | 76 | 2.75 |
| ADC | 21 | 1.27 | 28 | 1.69 | 49 | 2.96 | 74 | 2.68 | 58 | 2.10 | 132 | 4.78 |
| AFAFC | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 5 | 0.18 | 0 | 0.00 | 5 | 0.18 |
| AFCS | 7 | 0.42 | 9 | 0.54 | 16 | 0.96 | 6 | 0.22 | 9 | 0.33 | 15 | 0.55 |
| AFLC | 87 | 5.25 | 27 | 1.63 | 114 | 6.88 | 104 | 3.77 | 64 | 2.32 | 168 | 6.09 |
| AFRES | 22 | 1.33 | 3 | 0.18 | 25 | 1.51 | 49 | 1.78 | 4 | 0.14 | 53 | 1.92 |
| AFSC | 50 | 3.02 | 40 | 2.41 | 90 | 5.43 | 118 | 4.28 | 56 | 2.03 | 174 | 6.31 |
| ARPC | 1 | 0.06 | 1 | 0.06 | 2 | 0.12 | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 |
| ATC | 97 | 5.85 | 112 | 6.76 | 209 | 12.61 | 284 | 10.29 | 123 | 4.46 | 407 | 14.75 |
| AU | 8 | 0.48 | 7 | 0.42 | 15 | 0.90 | 18 | 0.65 | 9 | 0.33 | 27 | 0.98 |
| HQ COMD | 6 | 0.36 | 21 | 1.27 | 27 | 1.63 | 10 | 0.36 | 17 | 0.62 | 27 | 0.98 |
| HQ USAF | 0 | 0.00 | 1 | 0.06 | 1 | 0.06 | 3 | 0.11 | 2 | 0.07 | 5 | 0.18 |
| MAC | 52 | 3.14 | 100 | 6.03 | 152 | 9.17 | 159 | 5.76 | 83 | 3.01 | 242 | 8.77 |
| NGB | 15 | 0.90 | 0 | 0.00 | 15 | 0.90 | 18 | 0.65 | 0 | 0.00 | 18 | 0.65 |
| PACAF | 16 | 0.97 | 82 | 4.95 | 98 | 5.92 | 51 | 1.85 | 57 | 2.07 | 108 | 3.92 |
| SAC | 187 | 11.28 | 302 | 18.21 | 489 | 29.49 | 383 | 13.88 | 365 | 12.23 | 748 | 27.11 |
| TAC | 57 | 3.44 | 130 | 7.84 | 187 | 11.28 | 143 | 5.18 | 249 | 9.03 | 392 | 14.21 |
| USAFA | 9 | 0.54 | 4 | 0.24 | 13 | 0.78 | 17 | 0.62 | 7 | 0.25 | 24 | 0.87 |
| USAFE | 1 | 0.06 | 79 | 4.76 | 80 | 4.82 | 2 | 0.07 | 67 | 2.43 | 69 | 2.50 |
| USAFSO | 0 | 0.00 | 6 | 0.36 | 6 | 0.36 | 2 | 0.07 | 9 | 0.33 | 11 | 0.40 |
| USAFSS | 2 | 0.12 | 12 | 0.72 | 14 | 0.84 | 7 | 0.25 | 25 | 0.91 | 32 | 1.16 |
| Not Reported | 0 | 0.00 | 21 | 1.27 | 21 | 1.27 | 6 | 0.22 | 20 | 0.72 | 26 | 0.94 |
| Totals | 651 | 39.27 | 1,007 | 60.73 | 1,658 | 100.00 | 1,496 | 54.21 | 1,263 | 45.79 | 2,759 | 100.00 |

**Comparison of Civilian/Military Personnel on Six Variables**

T-tests were computed to determine statistically significant differences between the means of civilian and military members' performance on the following six variables that might be pertinent to the members' job assignment or upgrading: (a) average number of tasks performed, (b) average task difficulty per unit of time spent, (c) job difficulty, (d) months in job, (e) job interest, and (f) job use of training and talents. Table 2 shows the means, standard deviations, and t-tests for each civilian/military pair by AFSC as well as the total samples for each of the job surveys.

**Average Number of Tasks Performed**

In all groups significant differences occurred between the number of tasks performed by civilians and military. Comparison of the number of tasks performed by all civilians and military members indicates there is a highly significant difference between the two groups. This is identical to the findings of Garza and Carpenter (1974) in the accounting and finance career field study.

Reliability of task information furnished by military personnel has been established (Madden, Hazel, & Christal, 1964; Morsh, Madden, & Christal, 1961). However, task information furnished by civilian members is only assumed to be reliable. The grade level of the civilian is tied almost directly to his job description, a situation that is not true for the military member. The civilian employee may tend to inflate his responses on a job inventory in the belief that in so doing he may prevent a downgrading of his position or possibly that by marking as many tasks in the job inventory as possible, even though the tasks may not be done on a regular and recurring basis, he can cause his position to be upgraded. On the other hand, the relatively greater number of tasks performed may be a function of considerably longer time in the craft. In this respect, regression equations were computed for the correlations between number of tasks performed and months in job for both groups. When the number of months in the job by civilian employees were equated to military members months on the job, then the predicted number of tasks performed by the military members nearly equalled number of tasks performed by the civilian employees. This finding offers substantial evidence that the civilian is not inflating his job performance, but rather that as the length of time on a job increases, so does the number of tasks performed increase.

**Average Task Difficulty Per Unit of Time Spent**

The average task difficulty per unit of time spent (ATDPUTS) is derived from task difficulty ratings furnished by civilian and military supervisory personnel, with task difficulty defined as the relative amount of time required to learn to perform the task. ATDPUTS values are computed by multiplying the mean task difficulty rating by the incumbent's percentage of time spent rating on the task, summing the products, and dividing by 100 resulting in an average task difficulty index with a range of 1 through 7.

As indicated in Table 2, all groups within the plumbing specialty, except the apprentice plumbers, are in high agreement on the ATDPUTS values. That a significant difference exists between the civilian and military plumbers at the apprentice level may be attributed to overall greater experience and knowledge that the relatively long term civilian employee has in contrast to the first-term airman (usually at this skill level, it would also be the first job assignment for the airmen).

The ATDPUTS comparison between military and civilian carpenters and masons reveal a pattern similar to that of the job difficulty index to be discussed later. In five out of the six job pairs, civilian members have a higher average task difficulty level than the military incumbents, and of the five differences, four are significant beyond the .05 level of confidence. The significant overall mean difference suggests that civilian carpenters and masons tend to perform tasks of greater difficulty.

**Job Difficulty Index**

The Job Difficulty Index (JDI), scaled from 1 to 25, is derived using the constant standard weight regression equation developed by Mead and Christal (1970). This index of job difficulty includes as predictor variables the number of tasks performed, number of tasks performed squared, and the ATDPUTS. Comparisons between civilian and military members were made for each skill level group by specialty. Significant differences between civilian employees and military members are evident for 10 out of 11 skill level groups. That the number of tasks performed by the incumbent exerts considerable influence on the job difficulty

*Table 2.* **Comparison of Civilian and Military Members on Six Job Variables**

| Specialty Title | ID | N | Number of Tasks Performed | | | ATDPUTS | | | Job Difficulty Index | | | Months in Job | | | Job Interest | | | Job Use of Training and Talents | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean | SD | t-test | Mean | SD | t-test | Mean | SD | t-test | Mean | SD | t-test | Mean | SD | t-test | Mean | SD | t-test |
| Apprentice Plumber | Civ | 38 | 146.89 | 81.07 | | 4.36 | .28 | | 12.86 | 4.38 | | 77.75 | 91.93 | | 5.61 | 1.16 | | 4.67 | 1.83 | |
| 55235 | Mil | 153 | 84.09 | 59.72 | 5.38[c] | 4.22 | .31 | 2.54[a] | 8.69 | 5.53 | 5.11[c] | 6.65 | 8.72 | 9.44[c] | 5.09 | 1.36 | 2.17[a] | 3.87 | 1.46 | 2.95[b] |
| Plumbing Specialist | Civ | 488 | 151.50 | 70.00 | | 4.43 | .27 | | 13.37 | 4.35 | | 142.81 | 107.14 | | 5.69 | 1.06 | | 4.82 | 1.45 | |
| 55255 | Mil | 599 | 141.94 | 76.38 | 2.13[a] | 4.40 | .28 | 1.79 | 12.66 | 4.45 | 2.64[b] | 40.14 | 33.28 | 22.18[c] | 5.20 | 1.25 | 6.88[c] | 3.92 | 1.37 | 10.49[c] |
| Plumbing Technician | Civ | 88 | 217.60 | 88.66 | | 4.89 | .33 | | 16.02 | 2.78 | | 191.64 | 107.49 | | 5.58 | 1.04 | | 4.87 | 1.44 | |
| 55275 | Mil | 148 | 164.53 | 97.40 | 4.18[c] | 4.81 | .39 | 1.64 | 15.33 | 4.28 | 5.27[c] | 61.08 | 61.37 | 11.88[c] | 5.49 | 1.11 | .62 | 4.53 | 1.47 | 1.73 |
| Structural Superintendent | Civ | 23 | 118.48 | 62.57 | | 5.36 | .21 | | 16.65 | 2.46 | | 178.28 | 130.70 | | 6.13 | 1.08 | | 5.22 | 1.14 | |
| 55295 | Mil | 56 | 78.39 | 48.38 | 3.06[b] | 5.40 | .25 | .68 | 14.45 | 2.72 | 3.35[c] | 42.68 | 44.11 | 6.91[c] | 5.87 | 1.10 | .96 | 5.11 | 1.46 | .32 |
| Total Plumbers | Civ | 651 | 158.51 | 77.36 | | 4.52 | .36 | | 14.08 | 4.45 | | 145.63 | 110.26 | | 5.68 | 1.08 | | 4.83 | 1.45 | |
| | Mil | 1,007 | 130.50 | 81.21 | 6.99[c] | 4.49 | .42 | 1.50 | 12.43 | 4.80 | 7.03[c] | 37.80 | 41.33 | 28.13[c] | 5.25 | 1.28 | 7.09[c] | 4.06 | 1.45 | 10.56[c] |
| Apprentice Carpenter | Civ | 157 | 115.01 | 70.51 | | 4.39 | .27 | | 12.44 | 4.07 | | 57.76 | 72.49 | | 5.38 | 1.09 | | 4.25 | 1.44 | |
| 55230 | Mil | 93 | 69.73 | 50.35 | 5.43[c] | 4.20 | .27 | 5.38[c] | 8.76 | 4.14 | 6.87[c] | 14.49 | 13.40 | 5.69[c] | 4.87 | 1.63 | 2.96[b] | 3.59 | 1.54 | 3.41[c] |
| Carpentry Specialist | Civ | 922 | 131.12 | 78.81 | | 4.45 | .27 | | 13.62 | 4.43 | | 101.16 | 94.95 | | 5.58 | 1.01 | | 4.65 | 1.44 | |
| 55250 | Mil | 647 | 99.85 | 80.25 | 7.68[c] | 4.36 | .33 | 5.92[c] | 11.06 | 4.55 | 11.14[c] | 26.69 | 24.50 | 19.50[c] | 4.82 | 1.48 | 12.09[c] | 3.51 | 1.51 | 15.13[c] |
| Apprentice Mason | Civ | 14 | 168.50 | 71.79 | | 4.50 | .11 | | 16.14 | 4.07 | | 69.50 | 75.45 | | 5.36 | 1.11 | | 4.43 | 1.68 | |
| 55233 | Mil | 30 | 81.87 | 46.56 | 4.81[c] | 4.40 | .15 | 2.23[a] | 10.57 | 3.74 | 4.48[c] | 15.50 | 18.13 | 3.74[c] | 4.60 | 1.78 | 1.47 | 3.37 | 1.38 | 2.21[a] |
| Masonry Specialist | Civ | 93 | 162.52 | 65.09 | | 4.58 | .16 | | 16.34 | 3.36 | | 102.47 | 105.25 | | 5.85 | 1.24 | | 4.67 | 1.45 | |
| 55253 | Mil | 160 | 131.91 | 87.73 | 2.93[b] | 4.49 | .23 | 3.33[c] | 13.68 | 4.21 | 5.20[c] | 28.03 | 28.63 | 8.44[c] | 4.91 | 1.59 | 3.86[c] | 3.70 | 1.69 | 4.63[c] |
| Structural Technician | Civ | 211 | 140.18 | 99.08 | | 4.94 | .42 | | 16.14 | 4.01 | | 96.94 | 96.96 | | 5.74 | .87 | | 4.89 | 1.29 | |
| 55270 | Mil | 259 | 86.83 | 80.02 | 6.46[c] | 4.89 | .48 | 1.19 | 12.90 | 4.42 | 8.24[c] | 30.49 | 37.79 | 10.13[c] | 5.49 | 1.34 | 2.34[a] | 4.39 | 1.74 | 3.47[c] |
| Structural Superintendent | Civ | 80 | 95.40 | 76.10 | | 5.30 | .31 | | 15.57 | 3.58 | | 78.10 | 79.85 | | 5.89 | 1.07 | | 5.14 | 1.29 | |
| 55295 | Mil | 37 | 66.86 | 28.00 | 2.21[a] | 5.39 | .25 | 4.55 | 14.56 | 2.02 | 1.60 | 16.91 | 9.73 | 4.63[c] | 6.05 | 1.04 | .76 | 4.92 | 1.55 | .80 |
| Total Carpenters and Masons | Civ | 1,496 | 130.55 | 81.32 | | 4.57 | .39 | | 14.13 | 4.43 | | 94.13 | 93.80 | | 5.61 | 1.03 | | 4.68 | 1.43 | |
| | Mil | 1,263 | 97.11 | 78.59 | 10.93[c] | 4.50 | .44 | 4.43[c] | 11.67 | 4.58 | 14.31[c] | 26.05 | 27.47 | 24.91[c] | 4.99 | 1.52 | 12.70[c] | 3.74 | 1.64 | 16.08[c] |

[a]Significant at .05 level.

[b]Significant at .01 level.

[c]Significant at .001 level.

index is apparent when the average number of tasks performed by the groups is compared to the JDI. In almost every case, when there is a significant difference in tasks performed between civilian and military there are corresponding differences in JDI. The overall comparisons for each specialty strongly suggest that civilian employees tend to perform the more difficult jobs within skill level. However, if the strong influence of number of tasks performed were to be eliminated, the job difficulty for the two groups would be quite similar (see Table 2).

**Months in Job**

The large differences noted by all groups (in months of duty AFSC) is to be expected. Career civilian employees will usually remain at the place they have selected to work and, because they are skilled craftsmen, would not be expected to change their occupation. On the other hand, many airmen are first-term airmen with a corresponding shorter time on the job. In addition, skill progression will cause an airman to change from one job to another as does promotion of the airman sometimes cause a job change. Of interest here is the pattern of time in the job for both civilian and military members by skill level within the plumbing specialty. For both civilian and military, months in job increases by skill level until the 55295 level is attained, then there is a drop in the number of months in the duty, probably caused by attrition. A similar pattern for the carpenters and masons is apparent, but a slight decrease is noted for the civilian members in the structural technician AFSC which is not true for the military members. As for the plumber, a considerable drop in number months in the job is noted at the Superintendent level.

**Job Interest**

The degree to which the incumbents found their job interesting was obtained from a background information attitudinal item rated on a 7-point scale. The scale ranged from 1 for "extremely dull" to 7 for "extremely interesting." In all skill levels except the carpentry and masonry superintendent the civilian members indicate that their jobs are more interesting than the military jobs, but not significantly so in all instances. In all specialties, job interest is reported above the mean, indicating that both civilian and military members find their jobs at least fairly interesting.

**Job Utilization of Training and Talents**

Also derived from a background information question in the job inventory was a rating on felt utilization of training and talents. Incumbents were offered a 7-point scale ranging from 1 "not at all" to 7 "perfectly." The lowest mean rating expressed was 3.37 (3 = "fairly well") by the military apprentice masons. The highest average rating was given by the civilian plumbing structural superintendents (5.22) which equates with "very well." Significant differences occurred between the civilian and military members in both the 3- and 5-skill level plumbing AFSCs as did differences in all skill levels of the carpentry and masonry specialties except the structural superintendent, indicating, for the most part, civilian members feel better utilized than military members. Highly significant differences also occurred between members for the total samples. In all cases, expressed job utilization ratings are above the scale 3 rating of "fairly well." The largest difference (1.14) was found between the civilian and military carpentry specialists. Of interest is that the two groups expressing the lowest job interest ratings (military carpentry specialists and military apprentice mason) also expressed the lowest job utilization ratings (3.51 and 3.37 respectively). Both civilian and military members of the structural superintendent groups, expressed the highest job utilization ratings which are comparable to the high job interest ratings expressed.

**Average Civilian and Military Grade Level**

Table 3 shows the average grade for each of four civilian pay schedules as well as the military average grade for each skill level by specialty.

There does not appear to be a clear-cut division of civilian pay classifications by skill level. Except for the civilian plumbing apprentice and the plumbing structural superintendent, all skill levels contain members from at least two of the three Wage Board classification schedules and in most specialties, all three Wage Board classification schedules are apparent. Within the General Schedule classification, it is surprising to find incumbents assigned to the apprentice carpenter, carpenter specialist, and plumbing specialist skill levels. It would be expected that white collar workers (General Schedule) would all be in professional, supervisory, clerical, or administrative positions.

Of special interest is the comparison between civilian and military carpenter and masonry specialists. The military average grade levels for

*Table 3.* **Average Civilian and Military Grade Level by Specialty**

| Specialty and AFSC | Grade | | | | |
|---|---|---|---|---|---|
| | Civilian | | | | |
| | GS | WG | WL | WS | Military |
| Apprentice Plumber (55235) | – | 7.4 | – | – | 2.4 |
| Plumbing Specialist (55235) | 7.0 | 8.9 | 8.3 | 8.0 | 4.1 |
| Plumbing Technician (55275) | 8.0 | 9.1 | 8.6 | 8.6 | 5.9 |
| Structural Superintendent, plumbing (55295) | – | – | – | 10.2 | 7.8 |
| Apprentice Carpenter (55230) | 5.5 | 7.8 | –* | –* | 2.8 |
| Carpentry Specialist (55250) | 7.5 | 8.9 | 8.6 | 7.4 | 4.0 |
| Apprenctice Mason (55233) | – | 9.7 | –* | – | 3.3 |
| Masonry Specilist (55253) | – | 9.4 | 9.8 | 8.3 | 4.0 |
| Structural Technician (55270) | 8.0 | 9.1 | 8.6 | 8.9 | 5.9 |
| Structural Superintendent, carpentry-masonry (55295) | 10.0 | 11.4 | –* | 11.0 | 7.7 |

*Only one incumbent in cell.

these two specialties are identical, but for the civilian members, the average grade level in all three Wage Board classifications is higher for the masonry specialist than it is for the carpenter specialist.

### Correlations Among Six Job Variables

Table 4 displays the intercorrelation coefficients for the total samples of each of the specialties among six job variables. The first three variables are of primary concern. It is noted that the coefficients for military and civilian employees are strikingly similar within specialty for task difficulty, job difficulty, and number of task performed. Across specialties however, only the correlations of job difficulty and number of tasks performed are similar.

*Table 4.* **Comparison of Civilian and Military Groups' Intercorrelations Among Six Variables**

| Variable | Variable | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| **Civilian Plumbers** | | | | | |
| 1. Number of tasks performed | | | | | |
| 2. Task difficulty (ATDPUTS) | .33 | | | | |
| 3. Job difficulty index | .89 | .65 | | | |
| 4. Months in job | .19 | .23 | .24 | | |
| 5. Job interest | **.01** | .07 | **.04** | **.02** | |
| 6. Job utilization | **.04** | .10 | **.08** | **.09** | **.64** |
| **Military Plumbers** | | | | | |
| 1. Number of task performed | | | | | |
| 2. Task difficulty (ATDPUTS) | .30 | | | | |
| 3. Job difficulty index | .87 | .64 | | | |
| 4. Months in job | .16 | .27 | .23 | | |
| 5. Job interest | .10 | .14 | .16 | **.06** | |
| 6. Job utilization | .12 | .21 | .20 | **.09** | **.60** |
| **Civilian Carpenters and Masons** | | | | | |
| 1. Number of tasks performed | | | | | |
| 2. Task difficulty (ATDPUTS) | **.02** | | | | |
| 3. Job difficulty index | .83 | .41 | | | |
| 4. Months in job | .11 | **.06** | .15 | | |
| 5. Job interest | **.02** | .17 | .07 | **–.01** | |
| 6. Job utilization | **.01** | .21 | .07 | **.06** | **.66** |
| **Military Carpenters and Masons** | | | | | |
| 1. Number of tasks performed | | | | | |
| 2. Task difficulty (ATDPUTS) | **.05** | | | | |
| 3. Job difficulty index | .81 | .47 | | | |
| 4. Months in job | **–.07** | **.05** | **–.05** | | |
| 5. Job interest | .10 | .22 | .22 | **.02** | |
| 6. Job utilization | .11 | .26 | .24 | **.01** | **.66** |

**Note.** – Coefficients in bold faced type are not significantly different from zero.

**Comparison of Civilian and Military Members in Duty Performance**

*Plumbers Duty Performance by Skill Level.* Table 5 shows the percentage of civilian and military members performing in each duty by skill level. No statistical tests of differences were made between the groups, but some differences of note do occur, especially at the 3-skill level. For most duty categories, more civilian members perform duties than do the military members. One exception is noted, however, in Duty D where more military members perform than civilian members, although the difference in percent members performing is very slight. Small differences are also noted at the 5- and 7-skill levels, but no extreme differences in percent members performing are found. At the superintendent level (AFSC 55295), two plumbing-specific duties (I and L) are performed somewhat differently by the military and civilian members, but performance is low for both groups.

Table 6 shows the estimated percent time spent by plumbers by AFSC. Percent time spent values less than five percent have been omitted to show primary work functions of the members at the various skill levels. Time spent for all groups is highly similar with some minor exceptions, such as the 3-skill-level military members who spend some percentage of time less than five percent in Duty G while the civilian members spend slightly more than five percent of their time in the duty. Both civilian and military 7-skill-level members spread their time across more duties than members of the other skill levels, and time spent by both groups is quite similar.

*Carpenters and Masons Duty Performance by Skill Level.* Table 7 compares civilian and military members by AFSC on percent members performing each duty in the Job Inventory. At least some percentage of members within each AFSC perform each duty, with some minor exceptions. Civilian 3-skill-level masons do not perform in Duty T (packing and crating), nor do the 9-skill-level military personnel. In addition, the military 9-skill-level members do not perform in Duty R (working with plaster and stucco) and Duty S (performing stone construction).

The estimated percent time spent in the major duties of the job inventory by each skill level is shown in Table 8. Percentages of less than five percent for members performing are omitted to distinguish clearly between the specialties.

For both civilian and military members in the carpentry specialty, the greatest time spent estimates are in the installation and maintenance of interior and exterior finishings (Duty I). The estimated time spent by the masons, for both groups, is spread more evenly across four duties (N, O, P, & Q). No overlap of duties performed by the carpenters into the masonry area is noted, but the masons, on the other hand, perform in a carpentry area, Duty I. Duty U (maintaining hand tools and power equipment) appears to be a universal duty performed to a considerable degree by both specialties and, with the exception of AFSC 55233 (civilian apprentice masons), by both civilian and military members. More estimated time is spent by both civilian and military structural technicians (AFSC 55270) in Duty I (installing and maintaining interior and exterior finishings) than is associated with any other duty. However, when duties A through F are viewed as a block of supervisory duties, then the time spent estimates for both groups clearly indicate that they perform more as supervisors than as technicians. The structural superintendents, on the other hand, perform only within the supervisory duties. Notably absent from the structural technician AFSC (55270) for both groups is time spent on training. Within the structural superintendent AFSC (55295) the military members apparently spend less than five percent of their time in Duty D (training) while the civilian members are estimated to spend only slightly more than five percent of their time. Maintaining hand tools and power equipment (Duty U) is performed by both groups at the 7-skill level, but not by the structural superintendents.

**Carpenter's Functional Duties**

*Cabinet Making.* Within Duty J (constructing and maintaining interior furnishings) are ten tasks that may be specifically construed as requiring the tools and equipment normally found in a well-equipped cabinet or carpenter shop that utilizes fixed or stationary equipment. Table 9 lists these tasks along with the percentage of civilian and military samples performing the tasks and the estimated percent time spent on the tasks. This function probably belongs in hierarchical job type 057 (woodcraftsman) (see Figure 1).

In only task J-3 (construct cabinets or cabinet doors) are at least 50% of the civilian carpenters spending any time. The highest percentage of military members is in task J-7 (constructing

*Table 5.* **Percent Plumbers Performing Duties by Skill Level**

| Duty | Duty Title | 55235 Apprentice Plumber | | 55255 Plumbing Specialist | | 55275 Plumbing Technician | | 55295 Structural Superintendent | |
|---|---|---|---|---|---|---|---|---|---|
| | | Civ N=38 | Mil N=153 | Civ N=488 | Mil N=599 | Civ N=88 | Mil N=148 | Civ N=23 | Mil N=56 |
| A | Organizing and planning | 29 | 27 | 48 | 49 | 90 | 86 | 100 | 96 |
| B | Directing and implementing | 53 | 35 | 55 | 69 | 94 | 91 | 100 | 98 |
| C | Inspecting and evaluating | 24 | 14 | 26 | 33 | 82 | 79 | 96 | 98 |
| D | Training | 13 | 16 | 26 | 34 | 68 | 75 | 87 | 79 |
| E | Working with forms, records, reports, directives, or technical data | 39 | 23 | 36 | 53 | 86 | 86 | 100 | 98 |
| F | Planning plumbing projects | 53 | 31 | 66 | 60 | 95 | 83 | 78 | 55 |
| G | Inspecting plumbing systems | 76 | 61 | 84 | 79 | 98 | 86 | 91 | 82 |
| H | Installing and replacing pipes, tubing, fittings, and appurtenances | 100 | 99 | 99 | 98 | 85 | 84 | 35 | 23 |
| I | Installing fixtures and equipment | 97 | 95 | 96 | 97 | 80 | 79 | 26 | 9 |
| J | Maintaining water distribution systems | 89 | 88 | 95 | 91 | 86 | 76 | 39 | 21 |
| K | Maintaining sanitary waste and sewer systems | 95 | 93 | 93 | 96 | 83 | 82 | 30 | 20 |
| L | Maintaining valves | 97 | 92 | 97 | 96 | 76 | 80 | 17 | 9 |
| M | Performing general plumbing functions | 95 | 96 | 97 | 97 | 84 | 83 | 61 | 36 |

*Table 6.* **Plumbers – Percent Time Spent in Duties by Skill Level[a]**

| Duty | Duty Title | 55235 Apprentice Plumber | | 55255 Plumbing Specialist | | 55275 Plumbing Technician | | 55295 Structural Superintendent | |
|---|---|---|---|---|---|---|---|---|---|
| | | Civ N=38 | Mil N=153 | Civ N=488 | Mil N=599 | Civ N=88 | Mil N=148 | Civ N=23 | Mil N=56 |
| A | Organizing and planning | | | | | 8 | 8 | 17 | 21 |
| B | Directing and implementing | | | | | 11 | 12 | 23 | 25 |
| C | Inspecting and evaluating | | | | | | | 12 | 16 |
| E | Working with forms, records, reports, directives, or technical data | | | | | 11 | 10 | 21 | 19 |
| F | Planning plumbing projects | | | | | | | | |
| G | Inspecting plumbing systems | 5 | | 7 | | 9 | 7 | 10 | 7 |
| H | Installing and replacing pipes, tubing, fittings, and appurtenances | 36 | 36 | 36 | 34 | 21 | 21 | | |
| I | Installing fixtures and equipment | 11 | 10 | 10 | 9 | 6 | 6 | | |
| J | Maintaining water distribution systems | 8 | 6 | 8 | 7 | 6 | 5 | | |
| K | Maintaining sanitary waste and sewer systems | 8 | 11 | 8 | 10 | 5 | 6 | | |
| L | Maintaining valves | 10 | 10 | 10 | 10 | | 6 | | |
| M | Performing general plumbing functions | 14 | 16 | 12 | 13 | 8 | 8 | | |

[a]Less than 5% time time omitted.

*Table 7.* **Percent Carpenters and Masons Performing Duties by Skill Level**

| Duty | Duty | 55220 Apprentice Carpenter | | 55250 Carpenter Specialist | | 55233 Apprentice Mason | | 55253 Masonry Specialist | | 55270 Structural Technician | | 55295 Structural Superintendent | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Civ N=157 | Mil N=93 | Civ N=925 | Mil N=647 | Civ N=14 | Mil N=30 | Civ N=93 | Mil N=160 | Civ N=211 | Mil N=259 | Civ N=80 | Mil N=37 |
| A | Organizing and planning | 33 | 15 | 41 | 40 | 57 | 20 | 45 | 44 | 85 | 79 | 91 | 97 |
| B | Directing and implementing | 25 | 12 | 43 | 42 | 50 | 23 | 53 | 49 | 90 | 85 | 95 | 97 |
| C | Inspecting and evaluating | 15 | 4 | 21 | 30 | 14 | 13 | 29 | 36 | 78 | 81 | 91 | 97 |
| D | Training | 10 | 5 | 15 | 20 | 14 | 7 | 30 | 31 | 55 | 55 | 74 | 73 |
| E | Working with forms, records, reports directives; or technical data | 24 | 13 | 27 | 36 | 7 | 13 | 26 | 45 | 78 | 83 | 91 | 95 |
| F | Performing project planning | 54 | 40 | 66 | 57 | 71 | 23 | 73 | 72 | 91 | 76 | 93 | 86 |
| G | Constructing forms | 59 | 58 | 60 | 58 | 79 | 57 | 83 | 78 | 45 | 31 | 14 | 5 |
| H | Framing buildings | 83 | 74 | 83 | 79 | 64 | 20 | 52 | 49 | 51 | 36 | 14 | 8 |
| I | Installing and maintaining interior and exterior finishing | 98 | 99 | 96 | 93 | 86 | 70 | 75 | 79 | 80 | 49 | 18 | 5 |
| J | Constructing and maintaining interior furnishings | 85 | 80 | 89 | 81 | 43 | 17 | 22 | 38 | 51 | 44 | 15 | 5 |
| K | Installing and maintaining locking devices | 87 | 73 | 88 | 83 | 36 | 17 | 19 | 28 | 56 | 48 | 14 | 8 |
| L | Performing heavy timber construction | 17 | 15 | 25 | 24 | 14 | 7 | 13 | 13 | 24 | 10 | 14 | 3 |
| M | Training aids | 14 | 15 | 21 | 20 | 14 | 7 | 9 | 9 | 18 | 11 | 13 | 5 |
| N | Preparing mortar, concrete, stucco, and plaster | 27 | 26 | 28 | 30 | 100 | 93 | 96 | 93 | 24 | 21 | 9 | 5 |
| O | Forming and maintaining concrete structures | 33 | 32 | 43 | 41 | 100 | 87 | 95 | 92 | 36 | 26 | 9 | 5 |
| P | Performing brick and block construction | 14 | 16 | 23 | 18 | 93 | 77 | 92 | 88 | 24 | 14 | 8 | 5 |
| Q | Setting and replacing ceramic and quarry tile | 37 | 22 | 37 | 26 | 86 | 87 | 95 | 91 | 27 | 16 | 6 | 5 |
| R | Working with plaster and stucco | 23 | 17 | 25 | 22 | 93 | 67 | 95 | 86 | 22 | 12 | 6 | 0 |
| S | Performing stone construction | 13 | 4 | 14 | 13 | 50 | 43 | 75 | 51 | 13 | 5 | 6 | 0 |
| T | Packing and crating | 13 | 5 | 20 | 19 | 0 | 3 | 12 | 13 | 18 | 12 | 8 | 0 |
| U | Maintaining hand tools and power equipment | 90 | 87 | 89 | 87 | 64 | 83 | 84 | 85 | 61 | 54 | 21 | 5 |

*Table 8.* **Carpenters and Masons – Percent Time Spent in Duties by Skill Level[a]**

| Duty | Duty Title | 55230 Apprentice Carpenter | | 55250 Carpenter Specialist | | 55233 Apprentice Mason | | 55253 Masonry Specialist | | 55270 Structural Technician | | 55795 Structural Superintendent | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Civ N=157 | Mil N=93 | Civ N=922 | Mil N=647 | Civ N=14 | Mil N=30 | Civ N=93 | Mil N=160 | Civ N=211 | Mil N=259 | Civ N=80 | Mil N=37 |
| A | Organizing and planning | | | | | | | | | 10 | 9 | 17 | 21 |
| B | Directing and implementing | | | | | | | | | 10 | 11 | 17 | 21 |
| C | Inspecting and evaluating | | | | | | | | | 9 | 9 | 18 | 22 |
| D | Training | | | | | | | | | | | 5 | |
| E | Working with forms, records, reports, directives, or technical data | | | | | | | | | 11 | 14 | 18 | 19 |
| F | Performing project planning | | | | | | | | | 12 | 12 | 11 | 9 |
| G | Constructing forms | | | | | | | | | | | | |
| H | Framing buildings | 11 | 9 | 13 | 9 | | | | | 7 | | | |
| I | Installing and maintaining interior and exterior finishings | 45 | 51 | 41 | 43 | 9 | 7 | | 9 | 16 | 15 | | |
| J | Constructing and maintaining interior furnishings | 7 | 7 | 8 | 6 | | | | | | | | |
| K | Installing and maintaining locking devices | 9 | 5 | 7 | 6 | | | | | | | | |
| L | Performing heavy timber construction | | | | | | | | | | | | |
| M | Training aids | | | | | | | | | | | | |
| N | Preparing mortar, concrete, stucco, and plaster | | | | | 14 | 12 | 11 | 11 | | | | |
| O | Forming and maintaining concrete structures | | | | | 20 | 22 | 19 | 19 | | | | |
| P | Performing brick and block construction | | | | | 15 | 15 | 16 | 14 | | | | |
| Q | Setting and replacing ceramic and quarry tile | | | | | 8 | 13 | 10 | 9 | | | | |
| R | Working with plaster and stucco | | | | | | 8 | 12 | 10 | | | | |
| S | Performing stone construction | | | | | | | | | | | | |
| T | Packing and crating | | | | | | | | | | | | |
| U | Maintaining hand tools and power equipment | 13 | 15 | 12 | 13 | | 11 | 6 | 6 | 6 | 8 | | |

[a]Less than 5% time spent omitted.

*Table 9.* **Cabinet Making Tasks Requiring Fixed or Stationary Equipment**

| Duty | Task | Task Title | Civilian | | Military | |
|---|---|---|---|---|---|---|
| | | | % Members Performing | % Time Spent | % Members Performing | % Time Spent |
| J | 2 | Construct book cases | 35 | .59 | 21 | .71 |
| J | 3 | Construct cabinets or cabinet doors | 50 | .79 | 26 | .81 |
| J | 4 | Construct chairs | 13 | .48 | 5 | .51 |
| J | 5 | Construct desk or wall plaques | 29 | .68 | 18 | .74 |
| J | 6 | Construct miscellaneous wall items | 33 | .62 | 20 | .75 |
| J | 7 | Construct picture frames | 45 | .75 | 43 | 1.18 |
| J | 8 | Construct storage bins | 45 | .67 | 27 | .75 |
| J | 9 | Construct tables | 35 | .64 | 18 | .78 |
| J | 10 | Construct wall or corner shelves | 42 | .61 | 23 | .68 |
| J | 11 | Construct wooden lockers | 34 | .62 | 16 | .64 |

picture frames). The military members do not exceed or even equal the civilian members in percentage of the group performing in any of the tasks. The relatively low percentage of members performing tasks involving fixed or stationary equipment may be an indication of under-utilization of the equipment but further research into equipment utilization would be required to make this determination.

*Locksmithing*. Three background questions in the job inventory pertained to locksmithing. Figure 2 shows the results of the responses to questions for members of the carpentry specialty (AFSC 552X0). Data from the masons and structural superintendents are not included because response was so minimal as to indicate locksmithing is not part of their duties.

As noted in Figure 2, minor differences in all three functions exist between civilian and military members at the 3- and 5-skill levels. No military 3- or 5-skill-level members are authorized or certified locksmiths, but they do gain knowledge of locksmithing by changing, picking, and adjusting locks.

### Progression to AFSC 55270 (Structural Technician)[2]

Normal progression route to AFSC 55270 (structural technician) is from either the 5-skill-level masonry specialty or from the 5-skill-level carpentry specialty. Progression from any other AFSC would be construed as cross-training into the craft area. Responses by 7-skill-level members indicating method of progression to that skill level are shown in Figure 3. There is an apparent difference in the numbers progressing from AFSC 55250 between civilian and military members. A far larger number of military than civilian members indicate normal progression from the carpentry specialist AFSC (55250). Progression from the masonry specialist AFSC (55253) is quite similar for the two groups, but the percentage of civilian members progressing to AFSC 55270 from some other AFSC is far higher than for the military members. It appears that not nearly so much control is maintained over the civilian input into the structural technician specialty (AFSC 55270) as it is for the military personnel.

### Tool and Equipment Utilization

Figure 4 graphically portrays tool and equipment utilization patterns for the plumbers, carpenters, and masons. Quite similar profiles are apparent for both civilian and military members, but tool and equipment usage by military personnel is, for the most part, consistently less than civilian members' usage.

### Civilian Job Series Classification

The job series classification in which the plumbing incumbents report they are assigned are mostly within the 4200 series (04, 05, 06, and 07) which includes pipefitting, pipefitting marine, steamfitting, and plumbing. The next largest block of personnel report being assigned in the 4700 series which includes building maintenance. A few other job series are reported with the numbers of incumbents ranging from one to six. Nearly 72 percent of the carpenters and masons are assigned to only five job series. The other 28 percent of the sample encompasses 76 different job series.



[2]Structural Technician AFSC (55270) was changed to 55273 effective 31 October 1976.

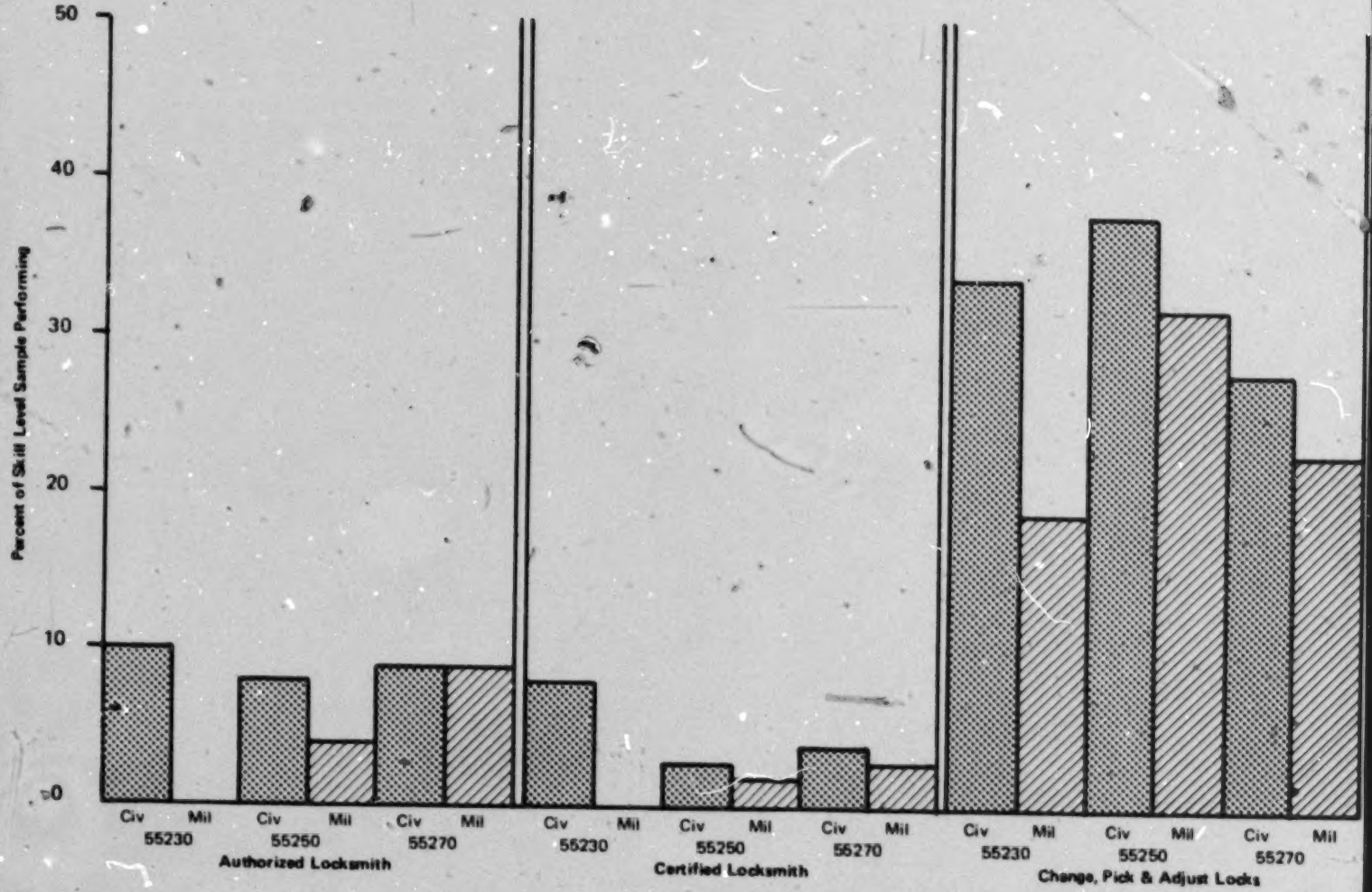



*Figure 2.* **Locksmith functions.**

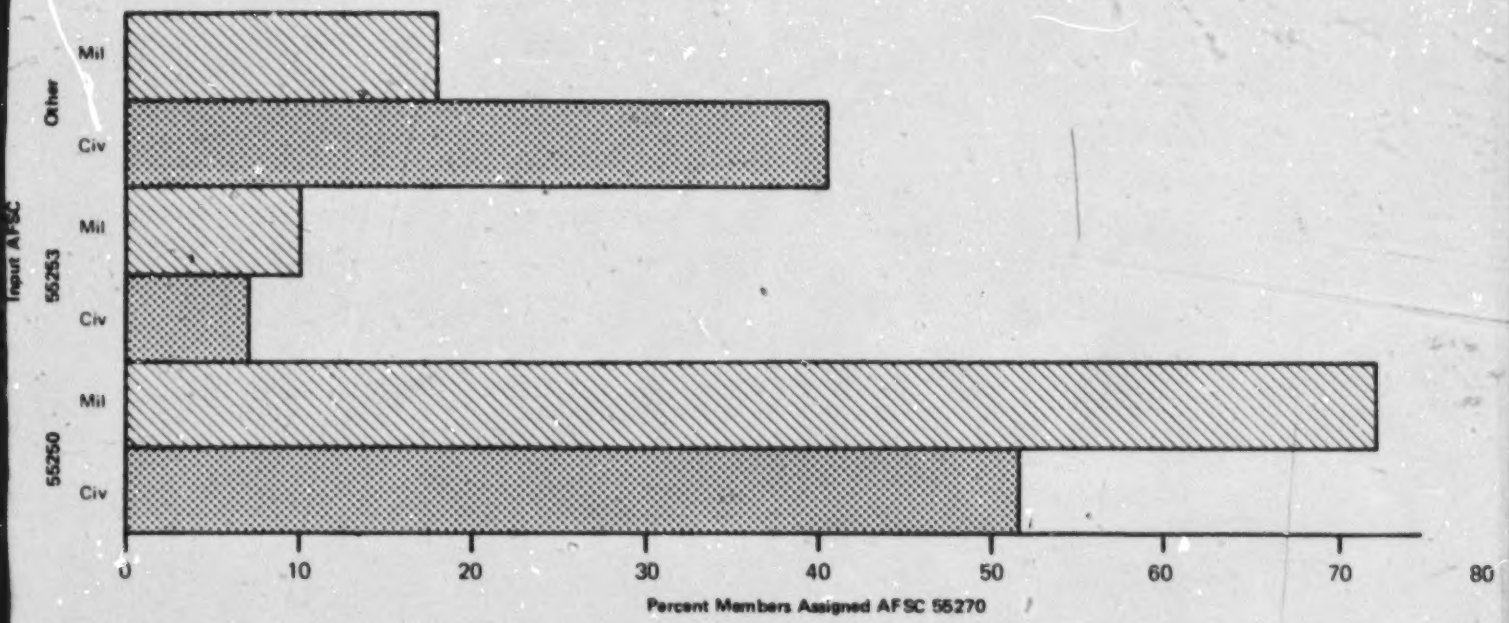
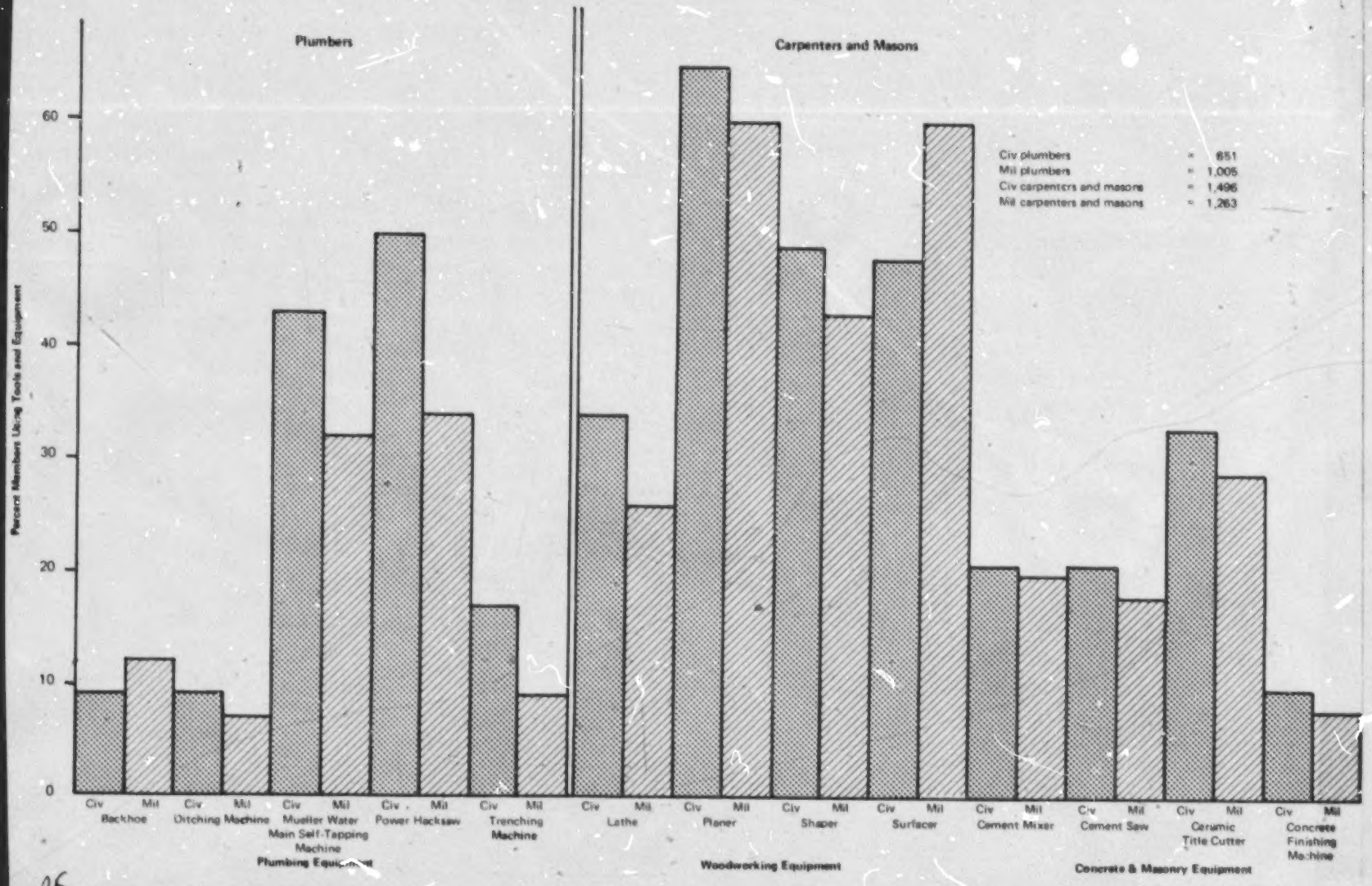



*Figure 3.* **Skill progression to AFSC 55270.**




25

26

*Figure 4.* Tool and equipment utilization by plumbers, carpenters, and masons.

A complete listing of the job series numbers, by AFSC, appears in Appendix A. Any one of three (or a combination of the three) assumptions may account for the wide range of job series classification numbers assigned to carpenters and masons: (a) the individual may not be aware of his correct job classification; (b) the job series classification may be correct as reported, indicating a great number of unique job assignments; or (c) a lack of standardized classification practices exists across CBPOs.

## IV. SUMMARY AND CONCLUSIONS

Significant differences between civilian and military members in the number of tasks performed, job difficulty, months in job, job interest, and job use of talents and training would appear to be conclusive evidence that the two groups are different. However, with the civilian members reporting a greater number of tasks performed, which may be a function of longer job tenure, then the apparent differences may be viewed in a different light. This is especially true in the determination of job difficulty, where the number of tasks performed and number of tasks performed squared enters disproportionately into the equation for determining job difficulty. The third factor of the equation, ATDPUTS, is quite similar for all skill level groups.

Although significant differences occurred in favor of the civilian members, (at both the 3- and 5-skill levels and the structural technician level) on the attitudinal variables of job interest and job utilization, job interest for both military and civilians is rather high, ranging from "fairly interesting" to a rating higher than "very interesting." Job utilization ratings on the part of the military in all AFSCs are somewhat lower than for the civilian members. However, at all levels the military members report that their jobs utilize their training and talents at least fairly well. The lower reported ratings may be a function of the slightly higher education level of the airmen.

Duty performance suggests that civilian and military members are performing approximately equally in their duties. In only the apprentice masons specialty are there differences in excess of 30 percent members performing, and then in only 3 out of 21 duties. These differences are probably a function of the differences in experience level and time on the job between the relatively inexperienced airman apprentice mason and the civilian mason assigned to an apprentice slot. Similarity of civilian and military plumber and carpenter/mason job descriptions, (Tables 5 and 7) and the similarity of intercorrelations on the six job variables indicate that the civilian and military members are performing quite similarly in the field.

No evidence of discriminatory practices against either civilian or military members in task assignment or utilization of tools and equipment was found. Generally, slightly more civilian members used tools and equipment than did the military members, but to no great extent. The lesser tool and equipment usage could indicate that the military are not receiving adequate training on equipment. However, the evidence is not sufficient to reach this conclusion without further investigation into the frequency of tool and equipment utilization by civilian and military members and a determination of the amount of training received in the field on the equipment.

The classification of civilian carpenters and masons into 81 job series appears on the surface to be somewhat extreme. However, this matter is the concern of the classification specialists and outside the confines of this report. Data are furnished only for informational purposes.

Of considerable consequences for future occupational surveys within civilian job areas is the finding that apparently the civilian members are not inflating their job performance. The greater number of tasks reported performed appears to be a function of considerably longer job tenure compared to the military members.

The present study did not make any comparisons between the civilian/military force structure now in effect with the feasibility of contract plumbing, carpentry, and masonry services; nor were military preparednesss requirements analyzed in this light. Future studies of civilian and military jobs should include consideration of these factors.

## REFERENCES


AF Manual 26-1. *Manpower policies and procedures.* Washington, D.C.: Department of the Air Force, 8 May 1973.

AF Manual 35-2. *Occupational analysis procedures for conducting occupational surveys and Air Force specialty evaluations.* Washington, D.C.: Department of the Air Force, 9 July 1968.

**Archer, W.B.** *Computation of group job descriptions from occupational survey data.* PRL-TR-66-12, AD-653 543. Lackland AFB, TX: Personnel Research Laboratory, Aerospace Medical Division, December 1966.

**Christal, R.E.** *The United States Air Force occupational research project.* AFHRL-TR-73-75, AD-774 574. Lackland AFB, TX: Occupational Research Division, Air Force Human Resources Laboratory, January 1974.

**Christal, R.E., & Ward, J.H., Jr.** The MAXOF clustering model. In M. Lorr & S.B. Lyerly (Eds.), *Proceedings of the conference on cluster analysis of multivariate data.* New Orleans, LA: Catholic University of America, June 1967, 11.02–11.45.

**Garza, A.T.** *Occupational survey of seven accounting and finance civil service series.* AFHRL-TR-72-67, AD-754 967. Lackland AFB, TX: Personnel Research Division, Air Force Human Resources Laboratory, July 1972.

**Garza, A.T., & Carpenter, J.B.** *Comparative job attributes of airmen and civil service personnel having similar job types.* AFHRL-TR-74-45, AD-786 407. Lackland AFB, TX: Occupational Research Division, Air Force Human Resources Laboratory, May 1974.

**Madden, J.M., Hazel, J.T., & Christal, R.E.** *Worker and supervisor agreement concerning the worker's job description.* PRL-TDR-64-10, AD-443 510. Lackland AFB, TX: Personnel Research Laboratory, Aerospace Medical Division, April 1964.

**Mead, D.F., & Christal, R.E.** *Development of a constant standard weight equation for evaluating job difficulty.* AFHRL-TR-70-44, AD-720 255. Lackland AFB, TX: Personnel Division, Air Force Human Resources Laboratory, November 1970.

**Morsh, J.E., & Christal, R.E.** *Impact of the computer on job analysis in the United States Air Force.* PRL-TR-66-19, AD-656 304. Lackland AFB, TX: Personnel Research Laboratory, Aerospace Medical Division, October 1966.

**Morsh, J.E., Madden, J.M., & Christal, R.E.** *Job analysis in the United States Air Force.* WADD-TR-61-113, AD-259 389. Lackland AFB, TX: Personnel Laboratory, Wright Air Development Division, February 1961.

**Stacy, W.J.** *Felt utilization of talent and training in two civil engineering career ladders.* AFHRL-TR-73-32. Lackland AFB, TX: Occupational Research Division, Air Force Human Resources Laboratory, November 1973. (Available to qualified requestors only.)

*APPENDIX A:* CIVILIAN JOB SERIES CLASSIFICATION BY AFSC

*Table A1.* **Carpenters, Masons, and Plumbers Job Series Classification by AFSC[a]**

| Job Series | Carpenters and Masons | | | | | | Plumbers | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 55230 | 55250 | 55233 | 55253 | 55270 | 55295 | 55235 | 55255 | 55275 | 55295 | |
| 0186 | | | | | 1 | | | | | | 1 |
| 0188 | | 1 | | | | | | | | | 1 |
| 0301 | 1 | | | | | | | | | | 1 |
| 0802 | | | | | 12 | 2 | | | 6 | | 20 |
| 0803 | | | | | 1 | | | | | | 1 |
| 0809 | | | | | 1 | | | | | | 1 |
| 0889 | 2 | 4 | | | 2 | | | | | | 8 |
| 0895 | | | | | 3 | | | | | | 3 |
| 1649 | | | | 1 | | | | | | | 1 |
| 2131 | | 1 | | | | | | | | | 1 |
| 2297 | | | | | | 1 | | | | | 1 |
| 2607 | | 1 | | | | | | | | | 1 |
| 2805 | | | | | | 1 | | | | | 1 |
| 3502 | | 1 | | | | | | | | | 1 |
| 3506 | | 1 | | | | | | | | | 1 |
| 3527 | | | | | 1 | | | | | | 1 |
| 3600 | | | | 2 | 1 | | | | | | 3 |
| 3602 | | | 1 | 3 | | | | | | | 4 |
| 3603 | | 5 | 5 | 61 | 6 | 1 | | | | 1 | 79 |
| 3605 | | | 3 | 2 | | | | | | | 5 |
| 3606 | 3 | 17 | | | | | | | | | 20 |
| 3653 | | 1 | | | | | | | | | 1 |
| 3654 | | | | | 1 | | | | | | 1 |
| 4102 | | | | | 1 | 2 | | | | | 3 |
| 4200 | | | | | | 1 | 2 | 15 | 9 | 2 | 29 |
| 4204 | | | | | | | 3 | 54 | 10 | | 67 |
| 4205 | | | | | | | | 4 | | | 4 |
| 4206 | | 1 | | | | | 26 | 352 | 62 | 3 | 444 |
| 4207 | | | | | | | | 1 | | | 1 |
| 4221 | | | | 1 | | | | | | | 1 |
| 4300 | | | 1 | | | | | | | | 1 |
| 4430 | | 2 | | | 1 | | | | | | 3 |
| 4432 | 2 | 5 | | | | | | | | | 7 |
| 4452 | | | | | | 1 | | | | | 1 |
| 4453 | | | | | | | | 6 | | | 6 |
| 4455 | | | | 6 | | | | | | | 6 |
| 4500 | | | | | | | | 2 | | | 2 |
| 4600 | 1 | 22 | | | 2 | 1 | | | | | 26 |
| 4603 | 1 | 1 | | | 1 | 1 | | | | | 4 |
| 4604 | 1 | 2 | | | | | | | | | 3 |
| 4605 | 6 | 73 | 1 | | 18 | 4 | | | | | 102 |
| 4607 | 110 | 575 | 1 | 4 | 87 | 13 | | 3 | | 2 | 795 |
| 4608 | | 1 | | | | | | | | | 1 |
| 4609 | | 3 | | | | | | | | | 3 |
| 4616 | | | | | | 4 | | | | | 4 |
| 4637 | | 1 | | | | | | | | | 1 |
| 4647 | | 1 | | | | | | | | | 1 |
| 4651 | | | | | 2 | | | | | | 2 |
| 4652 | 4 | 7 | | | | 1 | | | | | 12 |

☆U.S. GOVERNMENT PRINTING OFFICE: 1978-771-122/4

Table A1 (*Continued*)

| Job Series | Carpenters and Masons | | | | | | Plumbers | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 55230 | 55250 | 55233 | 55253 | 55270 | 55295 | 55235 | 55255 | 55275 | 55295 | |
| 4654 | | 5 | | | | | | | | | 5 |
| 4656 | | 1 | | | | | | | | | 1 |
| 4670 | | 1 | | | | | | | | | 1 |
| 4676 | | | | 2 | | | | | | | 2 |
| 4700 | | 2 | | | 1 | 1 | | | | | 4 |
| 4702 | | 1 | | | | | | | | | 1 |
| 4703 | | 2 | | | 9 | 19 | | 1 | | 6 | 37 |
| 4704 | | | | 3 | 19 | 17 | | | | 8 | 47 |
| 4706 | | 1 | | | | | | | | | 1 |
| 4707 | | 3 | | | | | | | | | 3 |
| 4709 | | 3 | | | | | | | | | 3 |
| 4714 | | 2 | | | | | | | | | 2 |
| 4749 | 5 | 42 | | 1 | 13 | 4 | 5 | 11 | 1 | 1 | 83 |
| 4752 | | 32 | | | 8 | | | 11 | | | 51 |
| 4758 | | | | | 1 | | | | | | 1 |
| 4772 | | 1 | | | | | | | | | 1 |
| 4801 | | | | | 1 | | | | | | 1 |
| 4855 | | | | | | | | 1 | | | 1 |
| 5200 | | | | | 1 | | | | | | 1 |
| 5250 | | 5 | | | | | | | | | 5 |
| 5253 | | 2 | | 1 | | | | | | | 3 |
| 5310 | | | | | | | | 3 | | | 3 |
| 5311 | 10 | 18 | | | 4 | | | | | | 32 |
| 5315 | | | | | | 1 | | | | | 1 |
| 5317 | | | | | | | 1 | | | | 1 |
| 5343 | | 1 | | | | 1 | | | | | 2 |
| 5352 | | 7 | | | 1 | | | | | | 8 |
| 5356 | | 2 | | | | | | | | | 2 |
| 5364 | 1 | 1 | | | | | | | | | 2 |
| 5525 | | 2 | | 1 | | | | | | | 3 |
| 5530 | | 1 | | | | | | | | | 1 |
| 5703 | | | | 2 | | | | | | | 2 |
| 5705 | | | | | 1 | | | | | | 1 |
| 6104 | | 1 | | | | | | | | | 1 |
| 6303 | | | | 1 | | | | | | | 1 |
| 6407 | | 1 | | | | | | | | | 1 |
| 6912 | | 1 | | | | | | | | | 1 |
| 7722 | | 1 | | | | | | | | | 1 |
| 8701 | | | | | | 1 | | | | | 1 |
| 8959 | | | | | 1 | | | | | | 1 |
| Total | 147 | 865 | 12 | 91 | 201 | 77 | 37 | 464 | 88 | 22 | 2,004 |

[a]143 incumbents failed to report job series number.